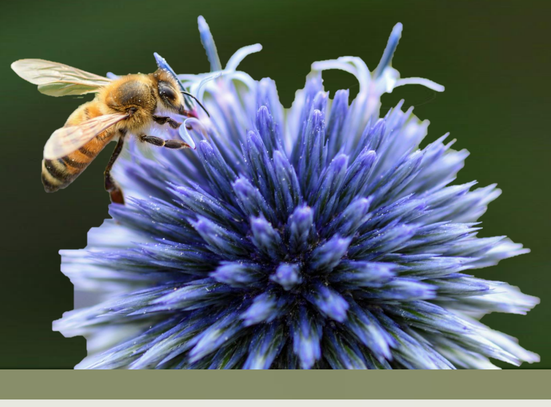
The effects of fungicides on bees

Literature Review



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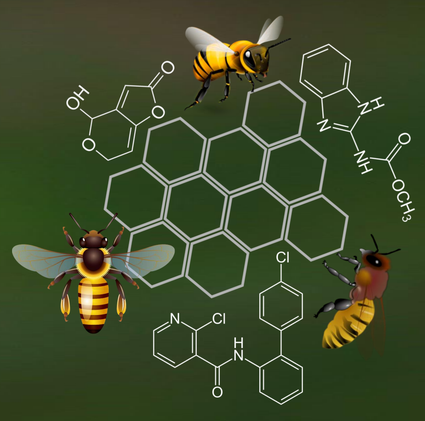

1. INTRODUCTION

Bees are essential organisms for both agricultural and natural ecosystems, because of the ecological service of pollination which they provide[1,2]. Unfortunately, in recent years, bee populations have been declining, which could have significant economic and environmental implications[3]. One of the main causes of this decline is the exposure to pesticides[4]. The negative impacts of insecticides have never been disputed, as they can directly kill bees and other pollinators[5]. Herbicides are also harmful because they reduce the diversity of flowers, which are their food resource[6]. However, the effects of fungicides, often considered "bee-safe", is less known. Furthermore, as the spectrum of pesticides in use is very wide, bees are normally not exposed to just one pesticide, but receive multiple exposures simultaneously, and some of these combinations can produce synergistic interactions[7,8], which are incompletely understood. This review takes a holistic view of the detrimental effects on bees caused by fungicides, taking into account lethal, sublethal and synergistic effects, and the spectrum of fungicides to which bees are exposed.

2. OBJECTIVES

1. To determine whether commercial fungicides affect bee populations. If so, identify these effects and classify them into lethal and sublethal effects.
2. To study the effects when combining fungicides with other pesticides. Classify these effects in additives or synergistic.
3. To clarify which products are most harmful at relevant field doses and at which stage of the crop cycle their application is most critical.
4. To determine how many fungicides are present in pollen and if these are also found in the products of bees: honey, wax and bee bread.
5. To identify knowledge gaps.

3. METHODOLOGY

1. Bibliographic research.
2. Creation of an Excel table.
3. Comparison of results and elaboration of graphs.

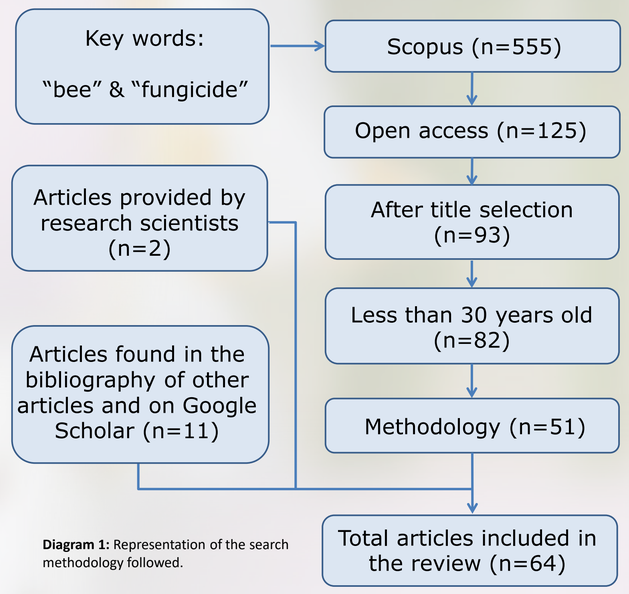

Diagram 1: Representation of the search methodology followed.

4. RESULTS

4.1. Fungicides alone

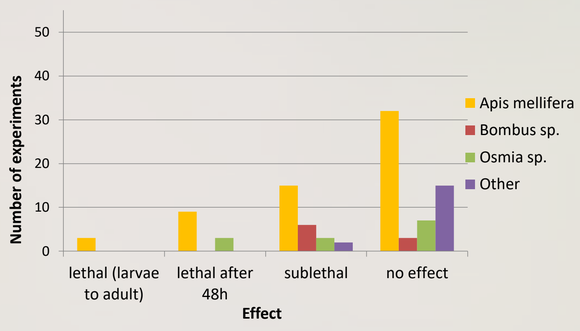

Figure 1: Comparison of the different effects of fungicides depending on the specie.

4.2. Fungicides + other pesticides

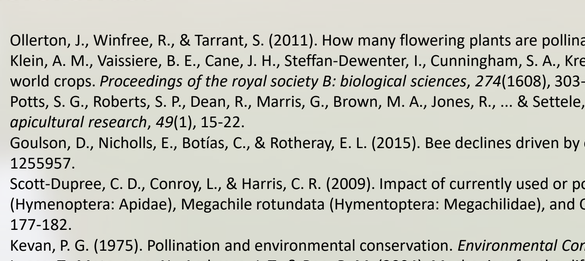

Figure 2: Comparison of the different effects of fungicides + other products depending on the specie.

4.3. Sublethal effects

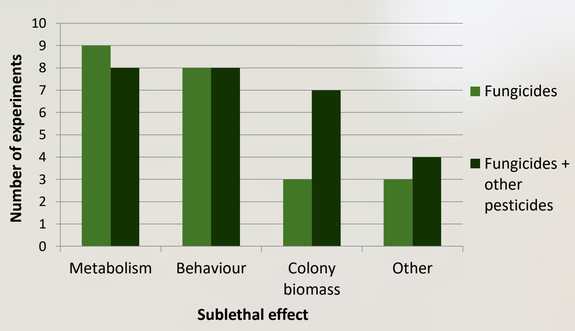

Figure 3: Comparison of the different sublethal effects of fungicides and fungicides + other products.

4.4. Combination effects

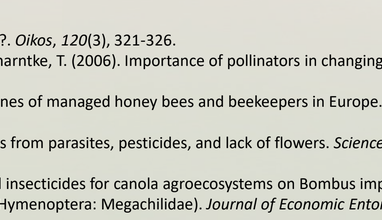

Figure 4: Comparison of the effect when combining fungicide s+ other products.

4.5. Harmfulness

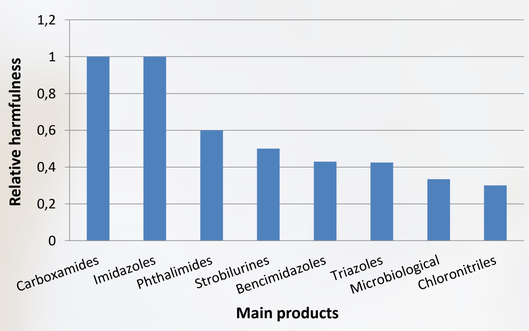

Figure 5: Harmfulness of the main fungicides studied.

4.6. Exposure

Figure 6: Comparison of means and maximums of fungicides found per sample.

4.7. Species

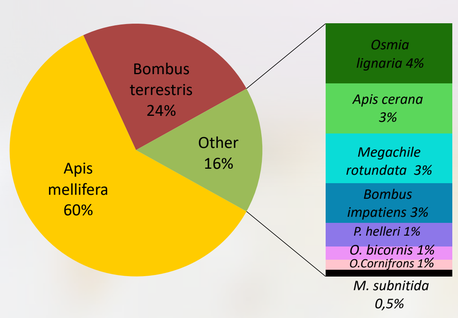

Figure 7: Total proportion of species tested.

4.8. Regions

Figure 8: Comparison of the number of studies carried out in each geographical region.

5. CONCLUSIONS

1. Commercial fungicides applied in field doses can indeed harm bees.
2. The effect of fungicides can increase when applied together with other products, such as insecticides.
3. Imidazoles and carboxamides can be potentially harmful to bees.
4. Fungicides in pollen can be transmitted to bee substances.
5. There's still a lot of research to be done.

References

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